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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/425,694	10/22/1999	ROLAND BRUNNER	BRUNNER-ET-A	9906

7590

09/17/2004

COLLARD & ROE PC
1077 NORTHERN BLVD
ROSLYN, NY 11576

EXAMINER

SONG, MATTHEW J

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 09/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/425,694

Applicant(s)

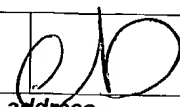
BRUNNER ET AL.

Examiner

Matthew J Song

Art Unit

1765



-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 June 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 and 11-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 11-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 1-9 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pirooz et al (EP 0701275) in view of Verhaverbeke et al (US 6,132,522).

Pirooz et al teaches silicon wafers may be pre-cleaned by being immersed in a SC-1 cleaning solution, which contains about 1000:1:1 to 1:1:1 parts by volume H₂O:H₂O₂:NH₄OH and has a temperature of about 0-100°C (col 2, ln 30-47). Pirooz et al also teaches metal removal is carried out by immersing the silicon wafer in a bath of an aqueous solution containing about 1:1 to 1:10000 parts by volume HF:H₂O and to enhance metal removal, the solution may additionally contain HCl, H₂O₂ or ozone (col 2, ln 48-60), this reads on applicant's firstly

Art Unit: 1765

treating the semiconductors in a bath of aqueous HF solution only containing HF and optionally containing HCl and optionally a surfactant. After the metal removal, the silicon wafers are rinsed in deionized water and the rinsed wafers are immersed in a bath containing a bout 0.1-50 ppm ozone at a temperature of about 0-60°C. Optionally, the ozonated water may additionally contain hydrochloric or nitric acid in a volume ratio ranging from about 1:1000 to 1:1 of acid:water (col 3, ln 1-35), this reads on applicant's treating the wafers in a bath with an aqueous O₃ solution containing O₃. Pirooz et al also discloses the treated wafers should be rinsed in deionized water. The final step is drying the wafers by spin-drying and isopropyl alcohol vapor drying techniques (col 3, ln 35-50).

Pirooz et al does not teach treating the semiconductor wafers in a bath with an aqueous HCl solution only containing HCl and optionally O₃.

In a method of wet processing electronic components, note entire reference, Verhaverbeke et al teaches a rinse fluid may be deionized (DI) water or a very dilute aqueous solution of a hydrochloric, hydrofluoric or ozone at a concentration not greater than 100 ppm to prevent metallic deposition on the surface of the electronic component precursors (col 5, ln 1-20). Verhaverbeke et al also teaches a sequential chemical process where electronic component precursors are moved from one reaction chamber to another, wherein each reaction chamber, bath, contains a different reactive chemical process fluid (col 5, ln 35-60 and col 5, ln 17-50). Verhaverbeke et al also teaches that certain baths may contain a rinse fluid but it is required that at least two of the baths in a sequence contain a reactive chemical (col 7, ln 60-67 and col 4, ln 1-10). Verhaverbeke et al also teaches hydrochloric acid, hydrofluoric and ozone are suitable reactive chemical process fluids (col 6, ln 35-60) and the method of sequential chemical

Art Unit: 1765

processing is applicable to cleaning, stripping and/or etching wafers (col 3, ln 5-15).

Verhaverbeke et al also teaches higher output of wafers and significant cost savings is achieved by eliminating the DI rinse between each chemical treatment step (col 4, ln 15-25).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pirooz et al DI water rinsing step with Verhaverbeke et al's rinsing fluid of an aqueous solution of HCl in a bath to prevent metal deposition ('522 col 5, ln 5-15).

Pirooz et al also does not teach these treatment steps form a treatment sequence, which avoids rinsing with water or another treatment liquid and the addition of fresh water or other liquids to the treatment baths.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Pirooz et al with Verhaverbeke's method of sequential chemical processing without rinsing to increase output and savings ('522 col 4, ln 15-25).

Referring to claims 1 and 11, the combination of Pirooz et al and Verhaverbeke et al teach a first treating a wafer in a bath of aqueous HF ('275 col 2, ln 48-60), treating in a bath of aqueous O₃ ('275 col 3, ln 14-35), then treating the wafers in a bath with an aqueous HCl solution ('275 col 3, ln 35-40 and col 5, ln 1-17), whereby these treatment steps avoid rinsing with water or another treatment liquid and the addition of fresh water or other liquids to the treatment baths ('522 col 3, ln 55 to col 4, ln 7). The combination of Pirooz et al and Verhaverbeke et al teach the HCl step is a rinsing step. However, this step reads on applicants' limitation of avoids rinsing, where rinsing is defined to be when a fresh treatment liquid is supplied continuously or at intervals on page 2 of the instant specification, because the HCl is in

Art Unit: 1765

a bath and not supplied continuously or at an interval. Also, the HCl is at a similar concentration as disclosed by applicant.

Referring to claim 2, the combination of Pirooz et al and Verhaverbeke et al teach an SC-1 treatment ('275 col 2, ln 30-45).

Referring to claim 3, the combination of Pirooz et al and Verhaverbeke et al teach drying ('725 col 3, ln 40-50).

Referring to claim 4, the combination of Pirooz et al and Verhaverbeke et al teach $(B_1+B_2)+B_3$, where m is 1.

Referring to claim 5, the combination of Pirooz et al and Verhaverbeke et al does not teach the HF concentration is 0.001-2% by weight. Concentration is well known in the art to be a result effective variable. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Pirooz et al and Verhaverbeke et al by conducting routine experimentation of a result effective variable to obtain same.

Furthermore, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. (In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235(CCPA 1955)).

Referring to claim 6, the combination of Pirooz et al and Verhaverbeke et al teaches .1-50 ppm of ozone ('275 col 3, ln 25-30). Overlapping ranges is held to be obvious (MPEP 2144.05).

Referring to claim 7, the combination of Pirooz et al and Verhaverbeke et al teaches using ozone to prevent metal deposition ('522 col 5, ln 1-15).

Referring to claim 8, the combination of Pirooz et al and Verhaverbeke et al teach drying by using spin drying, this reads on applicant's centrifuging, and using isopropyl alcohol.

Art Unit: 1765

Referring to claim 9, the combination of Pirooz et al and Verhaverbeke et al teaches NH_4OH and H_2O_2 ('275 col 2, ln 30-50).

3. Claims 12-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pirooz et al (EP 0701275) in view of Verhaverbeke et al (US 6,132,522) as applied to claims 1-9 and 11 above, and further in view of Berman (US 5,014,737) or Davison et al (US 5,593,538).

The combination of Pirooz et al and Verhaverbeke et al teach all of the limitations of claims 12-15, except the circulating of treatment liquids of the baths by taking a part from each of the baths, filtering and returning the part to the corresponding treatment bath.

In an apparatus for a recirculating chemical bath, note entire reference, Berman teaches a high purity chemical bath includes a process tank and a sump chamber disposed directly adjacent to the process tank. Berman also teaches the sump chamber includes a fitting in the bottom which directs liquid from the sump into a pump/filter circuit and the out of which is fed into the bottom of the process tank. The liquid is caused to overflow the process tank and flow into the sump chamber, this reads on applicants' taking part of the bath and filtering and returning the part to the bath (Abstract). Berman also teaches wafer etching and cleaning in the semiconductor industry require high levels of purity during processing and to reduce contaminating particulates various in-process recirculating filtering arrangements have evolved (col 1, ln 5-20). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Pirooz et al and Verhaverbeke et al by using the recirculating baths taught by Berman to reduce contaminating particulates in the bath and to extend the useful life of the bath.

In a method of etching a semiconductor, Davison et al teaches a recirculating bath of an etchant and recirculation of the etchant is established by overfilling the tub with the etchant and the portion of the etchant that overflows the tub is collected in a recirculating path, pumped through a filter and injected back into the tub (col 2, ln 30-60). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Pirooz et al and Verhaverbeke et al by using the recirculating baths taught by Davison et al to reduce contaminating particulates in the bath and to extend the useful life of the bath.

Response to Arguments

4. Applicant's arguments with respect to claims 12-15 have been considered but are moot in view of the new ground(s) of rejection.

5. Applicant's arguments filed 6/18/2004 have been fully considered but they are not persuasive.

In response to applicant's argument that there is no suggestion to combine the references (pg 15 first possibility), the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Verhaverbeke et al teaches the elimination of a DI rinse between each chemical treatment step results in significant savings and higher output. The

Art Unit: 1765

higher output and increased savings is sufficient motivation to a person of ordinary skill in the art at the time of the invention to modify Pirooz by eliminating the DI rinse, as taught by Verhaverbeke et al.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art (pg 15 and 16). See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Verhaverbeke et al teaches a rinse fluid may be DI water or a very dilute aqueous solution of hydrochloric acid to prevent metallic deposition of the surface of electronic component precursors and ozone is another additive used during rinsing. The use of a rinse comprising hydrochloric acid is taught to be advantageous in prevention of metallic deposition. Therefore, the prevention of metallic deposition by using a hydrochloric solution as a rinse would be sufficient motivation to a person of ordinary skill in the art at the time of the invention to modify Pirooz et al by using a solution of hydrochloric acid as a rinse in place of the DI rinse to prevent metallic deposition.

Applicants' argument that there is no explanation by the Examiner to explain why a person skilled in the art would not eliminate both rinses is noted but is not found persuasive. The Examiner is not required to explain why a particular scenario would or would not be obvious. The Examiner is required to show why the claimed invention is obvious in view of the cited prior art. The Examiner has established a proper prima facie case of obviousness; therefore burden

Art Unit: 1765

shifts to applicants to show unobvious differences between the claimed invention and the prior art. Furthermore, Verhaverbeke et al teaches certain baths may contain a rinse fluid but it is required that at least two of the baths in sequence contain a reactive chemical process fluid and maybe only one rinse may be eliminated (col 10, ln 15-35 and col 7, ln 50-67). Therefore, the two process A and C of Pirooz et al must be completed without rinsing and the final rinse can be performed, as taught by Verhaverbeke et al.

Applicants' third argument is noted but is not found persuasive. Applicants allege that Examiner has not explained why a person skilled in the art would not modify both Step B and Step D. The Examiner is not required to explain why a particular scenario would or would not be obvious. The Examiner is required to show why the claimed invention is obvious in view of the cited prior art. The Examiner has established a proper prima facie case of obviousness; therefore burden shifts to applicants to show unobvious differences between the claimed invention and the prior art. Furthermore, Verhaverbeke et al teaches certain baths may contain a rinse fluid but it is required that at least two of the baths in sequence contain a reactive chemical process fluid and maybe only one rinse may be eliminated (col 10, ln 15-35 and col 7, ln 50-67). Therefore, the two process A and C of Pirooz et al must be completed without rinsing and the final rinse can be performed, as taught by Verhaverbeke et al. The B process step of Pirooz et al must be eliminated and thus is not modified.

Applicants' fourth argument is not found persuasive. Applicants allege that the Examiner has not explained why a person skilled in the art would not modify step b and eliminated step d. The Examiner is not required to explain why a particular scenario would or would not be obvious. The Examiner is required to show why the claimed invention is obvious in view of the

Art Unit: 1765

cited prior art. The Examiner has established a proper prima facie case of obviousness; therefore burden shifts to applicants to show unobvious differences between the claimed invention and the prior art. Furthermore, Verhaverbeke et al teaches certain baths may contain a rinse fluid but it is required that at least two of the baths in sequence contain a reactive chemical process fluid and maybe only one rinse may be eliminated (col 10, ln 15-35 and col 7, ln 50-67). Therefore, the two process A and C of Pirooz et al must be completed without rinsing, step B is eliminated, and the final rinse can be performed, as taught by Verhaverbeke et al.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Pirooz et al is not required to teach three treatment steps. Pirooz et al is relied upon as a teaching of two treatments followed by a rinsing step. The Verhaverbeke et al reference teaches using aqueous HCl instead of DI water as a rinse, which reads on applicants' third treatment solution.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Wong (US 6,273,098) teaches the useful life of a chemical bath can be extended by recirculating the bath fluid through a filter system to remove particles from the fluid (col 3, ln 50-65).

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 571-272-1468. The examiner can normally be reached on M-F 9:00-5:00.

Art Unit: 1765

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Matthew J Song
Examiner
Art Unit 1765

MJS

NADINE G NORTON
SUPERVISORY PATENT EXAMINER
